PFP nuclear chemical operators use a glovebox to stabilize plutonium-bearing residues.

Sand, slag and crucible residues are shown here before and after grinding. Operators needed to crush some of the chunks before final repackaging.

Plutonium-bearing 'sand, slag and crucible' repackaging completed at Plutonium Finishing Plant

Michele Gerber, *Fluor Hanford*

Last month, the Plutonium Finishing Plant staff completed repacking a large collection of plutonium-bearing residues known as SS&C (sand, slag and crucible).

Crucibles made of magnesium oxide were the forming structures in which plutonium fluoride was fired to produce plutonium metal during the weapons-production era at Hanford. The crucibles were broken to remove the plutonium metal units (known as "buttons"). "Slag" is the solid residue that was left clinging to the crucible fragments after they were broken. And excess magnesium-oxide powder from the firing of the plutonium fluoride is known as "sand." The SS&C material now awaits final characterization and shipment to permanent disposal off the site.

The completion of SS&C repackaging, finished nearly six months ahead of schedule, is an important step toward PFP's most urgent goal of stabilizing all 17.8 metric tons of plutonium-bearing product items and leftovers by February 2004. SS&C materials constitute about two-thirds (by bulk) of a large and diverse group of plutonium-bearing materials known as residues. Processing of a smaller group of residues known as "group 1 alloys" was completed at nearly the same time.

"We have a dedicated and talented team here at PFP, including all of the technical, operations, and support-and-administrative staff," said Fluor Hanford Residues Stabilization manager Brian Skeels. "Together, we work every day to respond to programmatic and physical issues to keep the residues-processing operation moving at a consistent speed with a high regard for quality and safety. As we continually beat our schedules, we all see obvious safety and cost benefits to the work we do. There is a tremendous feeling of accomplishment in this steady top-to-bottom effort."

Ten-month project

The SS&C repackaging work, which took place in about 10 months during 2002, processed more than 1,400

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Plutonium-bearing 'sand, slag and crucible' repackaging completed at PFP, cont.

cans of materials into just under 800 new billet cans. The new containers were placed inside thick vented-and-filtered plastic bags, measured to determine plutonium content and then placed inside special 55-gallon drums known as pipe overpack containers, or POCs. As such, they are destined for disposal as transuranic waste at the Department of Energy's Waste Isolation Pilot Plant in New Mexico. Shipments to WIPP are expected to begin in 2004.

The stainless-steel-lined POCs hold one to four billet cans and have secondary HEPA (high-efficiency particulate air) filtration in addition to the HEPA filtration of the bags themselves. The SS&C repackaging work involved handling a bulk weight of about 2,500 kilograms of plutonium-bearing materials, including more than 40 kilograms of plutonium.

The process of transferring the SS&C material from the old can to the new billet can was accomplished in a glovebox in the main PFP facility. Workers inspected the materials in the old cans for prohibited items and removed any materials not acceptable under WIPP criteria. Larger chunks of SS&C material were sorted in a sieve and then crushed so that each piece was no larger than an eighth of an inch in diameter. Crushing was necessary to ensure accurate measurement for plutonium content.

Once the billet can was closed and brought outside the glovebox, it was assayed (i.e., analyzed to determine its contents) for accountability purposes using a Segmented Gamma Scanning Assay System. Workers then maximized the load in each POC based on plutonium content, and placed the vented bags containing the billet cans inside the POCs.

The configuration of the SS&C material means that a small portion remains to be measured before permanent disposal, using more sensitive and complex assay devices known as calorimeters. This equipment is now being qualified and readied for use.

Work went smoothly

For the most part, the SS&C repackaging work went smoothly, according to Skeels, especially after millwright Terry Brown made improvements to the crusher, reducing the frequency of breakdowns. The SS&C crew of eight or nine people per shift could load between one and two POCs per day. "An old can could come out of the vault for processing in the morning and be packed out in a POC by the end of the swing shift," Skeels said. The work progressed faster than thermal stabilization work, as no furnace processing was involved.

As soon as the SS&C work was completed, Skeels' residues team began grinding and repackaging another large portion of residues known as OX/MOX (plutonium oxides and mixed oxides). OX/MOX processing is scheduled to be completed next November. The Residues Sub-Project is one of three major sub-projects remaining in PFP's plutonium stabilization endeavor. The Thermal Stabilization Sub-Project under Rob Cantwell began stabilizing tiny, plutonium-laced cubes of polystyrene known as polycubes last July, and is expected to complete that work in March. Cantwell's team will then begin stabilizing chlorides, and the team members expect to finish in early 2004.

Stabilization and canning of plutonium metals, led by Rob Gregory, was completed in September 2001, and Gregory's team is working to complete the canning of plutonium oxides by early 2004. The metals and oxides are being double-welded into new stainless steel "3013" cans — containers meeting stringent new specifications of the Department of Energy's Standard 3013. PFP workers completed a major effort to stabilize 4,500 liters of plutonium-bearing solutions in July 2002.

According to George Jackson, Fluor Hanford vice president of the Nuclear Material Stabilization Project, the next major tasks at the PFP complex include cleaning out plutonium that's been "held up" in old equipment, size-reducing and removing old equipment and deactivating the 60 structures in the compound by September 2006. ■